

**ARIZONA GAME AND FISH DEPARTMENT
HABITAT PARTNERSHIP COMMITTEE
HABITAT ENHANCEMENT AND WILDLIFE MANAGEMENT PROPOSAL**

Game Branch / HPC Project Number: 14-519

PROJECT INFORMATION

Project Title: Region 5 BHS Research Proposal for Aravaipa and Redfield Canyon

Region and Game Management Unit: 5, units 31 and 32

Local Habitat Partnership Committee (LHPC):

- Tucson and Safford

Was the project presented to the LHPC?

YES[X] (**Tucson**) **NO**[]

Has this project been submitted in previous years? **YES**[] **NO**[X]

If Yes, was it funded? **YES**[] **NO**[] → **Funded HPC Project #(s):**

Project Type: Research to inform any future management decisions with regard to disease, genetics and metapopulation dynamics.

Brief Project Summary:

Bighorn populations in Arizona are actively managed due to their low intrinsic rate of increase which makes this species slow in recovering from population level reductions and in recolonizing areas formerly inhabited. Translocations are a common tool for reestablishing historical populations that have been extirpated and for augmenting existing small populations. A science-informed decision making process must guide these management efforts. We currently lack disease exposure and genetic information from our populations to be able to make informed decisions about management options such as translocations or hunt unit boundaries.

Big Game Wildlife Species to Benefit: bighorn sheep

Implementation Schedule (Month/Day/Year):

Project Start Date: September 1, 2014

Project End Date: June 30, 2018

Environmental Compliance:

NEPA Completed: **Yes**[] **No**[X] **N/A**[]

Projected Completion Date: To be determined

State Historic Preservation Office - Archaeological Clearance:

Yes[] **No**[X] **N/A**[]

Projected Completion Date: To be determined

Arizona Game and Fish Department EA Checklist: **N/A**[]

To be Completed by: Regional personnel

Projected Completion Date: Summer of 2015

PROJECT FUNDING

Special Big Game License Tag Funds Requested:

\$ 82,800 YR1

\$ 16,500 YR2

Cost Share or Matching Funds:

\$ TBD

Total Project Costs:

\$ 99,300

PARTICIPANT INFORMATION

Applicant (please print):

Region 5 WM's and Jim
Heffelfinger

Address:

555 N. Greasewood Road
Tucson, AZ 85745

E-mail:

jheffelfinger@azgfd.gov

Telephone: 520-628-5376

Date: September 1, 2014

AGFD Contact and Phone No. (If applicant is not AGFD personnel):

Project has been coordinated with:

Local members of the ADBSS.

NEED STATEMENT – PROBLEM ANALYSIS:

Bighorn populations in Arizona are actively managed in a number of ways largely due to their low intrinsic rate of increase which makes this species slow in recovering from population level reductions and in recolonizing areas formerly inhabited. Translocations are a common tool for reestablishing historical populations which have been extirpated and, for augmenting existing small populations for various reasons. However, with an increasing understanding of disease in wild sheep and the potential to inadvertently spread pathogens, it is important that all translocations consider the risks associated with introducing deadly agents into naïve populations. We currently have information about disease exposure for only a few populations in southeastern AZ from past research, sporadic hunter samples, and actual disease epizootics. Some populations are the result of translocations from elsewhere and some are indigenous and have never been augmented with other sheep. To reduce the risk of introducing disease that could dramatically reduce sheep populations, we must have a clear picture of what populations are exposed to what pathogens. Source locations for desert sheep are not plentiful now, but we need to lay the ground work now of having information in hand to be available as opportunities arise.

In addition to the need for disease exposure profiles in our herds to match appropriately with source herds, we also can benefit from learning more about the level of inbreeding in our herds. We can infer from the history of how translocated herds were founded that they have less genetic diversity than their parent herds. A paper this year by Phil Hedrick used population genetic estimates that indicate Aravaipa has a lower genetic diversity than average sheep populations. This is not surprising, considering the small number of founders that started the population. We have never conducted a genetic analysis of bighorns in Aravaipa. There is no evidence of genetic inbreeding depression (reduced survival or reproduction) in this population, but knowing more about genetic diversity will allow us to make informed decisions about whether management actions are needed.

A statewide genetic analysis of sheep herds found the Silver Bell sheep population to have the highest inbreeding coefficient in the state and at levels considered high for any animal. This population should receive a few rams to help increase genetic diversity and this is being planned for fall of 2015. Toward that end, we are requesting 2 additional collars to place on those animals. The cost of the capture of those will be covered under a separate translocation proposal.

PROJECT OBJECTIVES:

To gather the necessary information to be able to make informed management decisions in the future with regard to the bighorn population inhabiting the Aravaipa, Galiuro and Redfield areas. Specific objectives include:

- Obtain disease exposure information to better assess potential risks to regional herds from domestic sheep or our management actions (primarily translocation). This will allow us to determine the most appropriate source population for any herd needing augmentation.
- Estimate several measures of genetic diversity to assess levels of inbreeding that could be exerting inbreeding depression on demographic population parameters.
- Assess movements and corridors to determine what subpopulations (or populations) are connected through sheep movements.
- Identify areas of sheep use to determine if sheep survey coverage is accurate and adequate

- Determine if camera traps can be used as a less expensive but reliable tool for estimating the number of bighorn in the population.
- Marked animals will assist in estimating observation rates for different habitat areas.

PROJECT DESCRIPTION AND STRATEGIES:

Year 1

Capture 10 sheep in GMU 31/32 and fit with GPS transmitters. This would include 3 males - (ideally 1 each from Redfield, Brandenburg, and Hell Hole area) to look at movements and connectivity without getting too many collared rams in the population. The 7 collared females to look at habitat use, unknown areas of distributions, and lambing areas. During the capture an additional 10 ewes would be captured and ear tagged only. All 20 sheep would have blood, nasal/pharyngeal swabs, and DNA samples taken under the direction and advice of the Department Veterinarian.

Year 2

Capture 10 additional ewes and replace any lost collars on either sex. This will give us a sample of 30 sheep in 2 years, about ¼ of the population. Geneticists prefer ewe DNA because they are more sedentary, but this can be refined with additional information. Included in this proposal are 2 additional GPS collars for rams we will bring in to the Silver Bells during the fall 2015 capture in R4 or R6 (separate proposal will be written for that capture).

Methods

Bighorn would be captured with a helicopter and net gun as is standard procedure. Sheep will not have to be returned to a staging area. Animals can be processed at the site of the capture and released to reduce overall stress to the animal. While in hand, we will collect blood, swabs, and tissue samples and outfit with a collar or ear tags then release immediately.

Swabs and blood samples will be sent to the lab as soon as possible for analysis. Genetic samples will be archived until after the capture in year 2 and then submitted with subsamples of hunter harvested sheep tissue from the Department archives to maximize the sample size and power of the analysis. Because of the way genetic data are analyzed and visualized it would not be beneficial to run these after year 1 and again in year 2. The genetic information is not as urgently needed as is the disease.

Since we will have these animals in hand, they will all be tagged with a collar and/or ear tag. These marked animals will give us the opportunity to explore new innovative survey and monitoring methodology. We are already deeply involved with an extensive camera trapping effort and so we can explore the ways to use the marked animals as a mark-recapture calculation to estimate sheep abundance. This method involves looking at the percent of marked animals observed on cameras to estimate the percent of the population observed. We will be consulting with our Research Branch and others in the field to discuss this possibility (It is a secondary opportunity). This could be tested and compared to the helicopter surveys to see if it's a viable technique for gathering data during the non-survey years.

PROJECT LOCATIONS:

Aravaipa Canyon Area

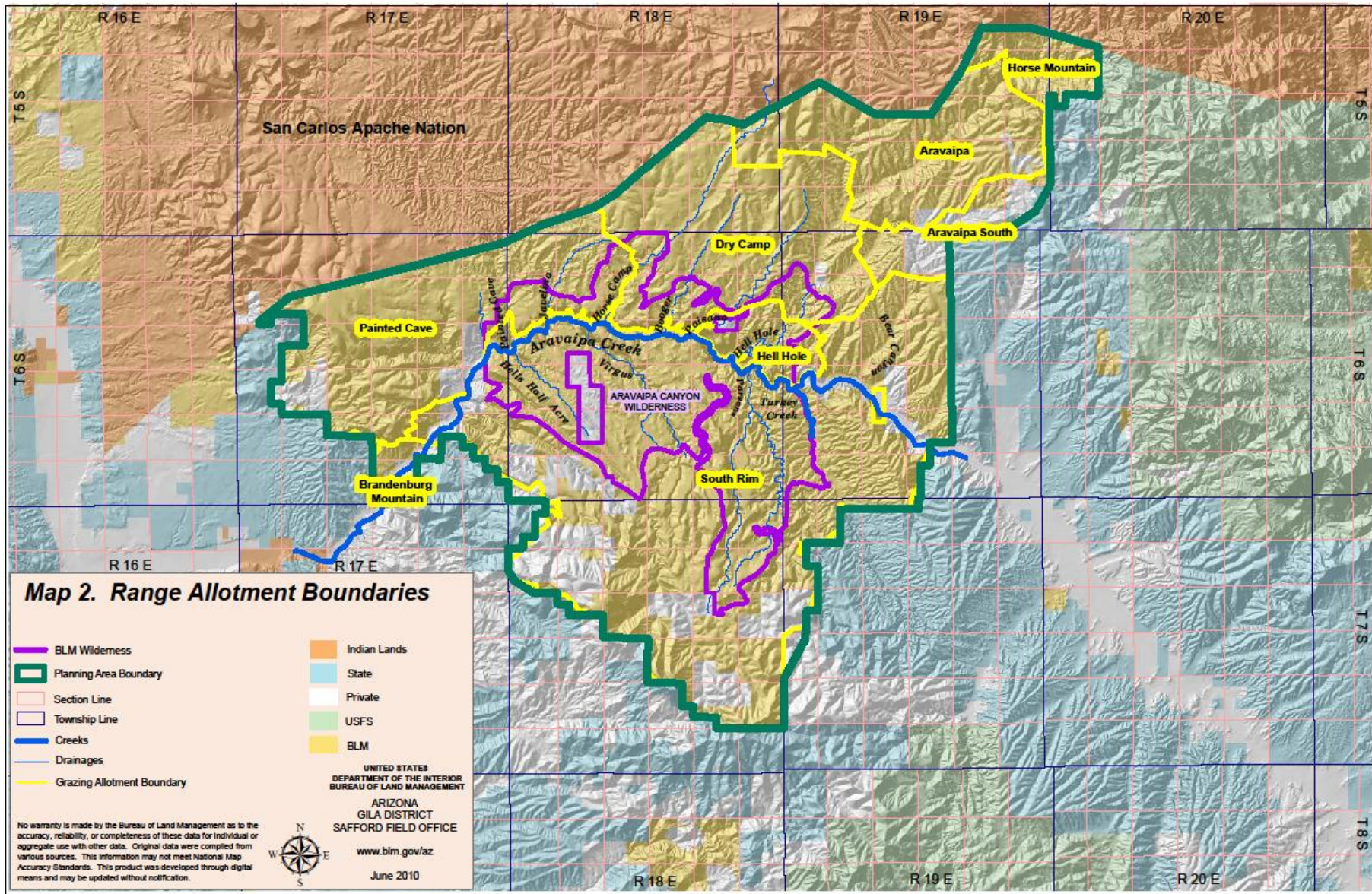





Figure 1
**MULESHOE ECOSYSTEM
MANAGEMENT PLAN**

Relief Map

-  Planning Boundary
-  Wilderness Boundaries
-  ACEC Boundary



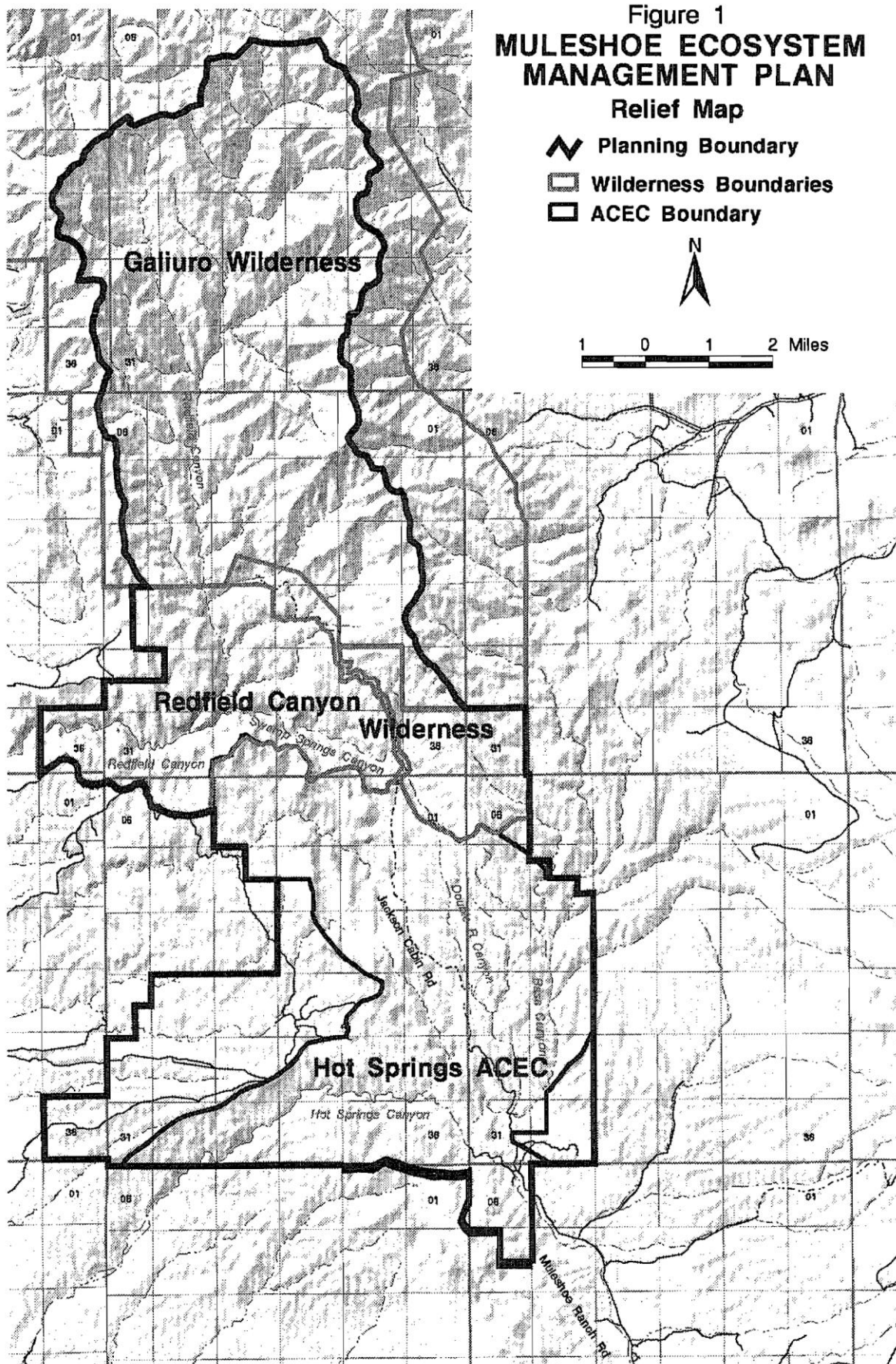
1 0 1 2 Miles

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T. 11 S.

T. 12 S.

T. 13 S.

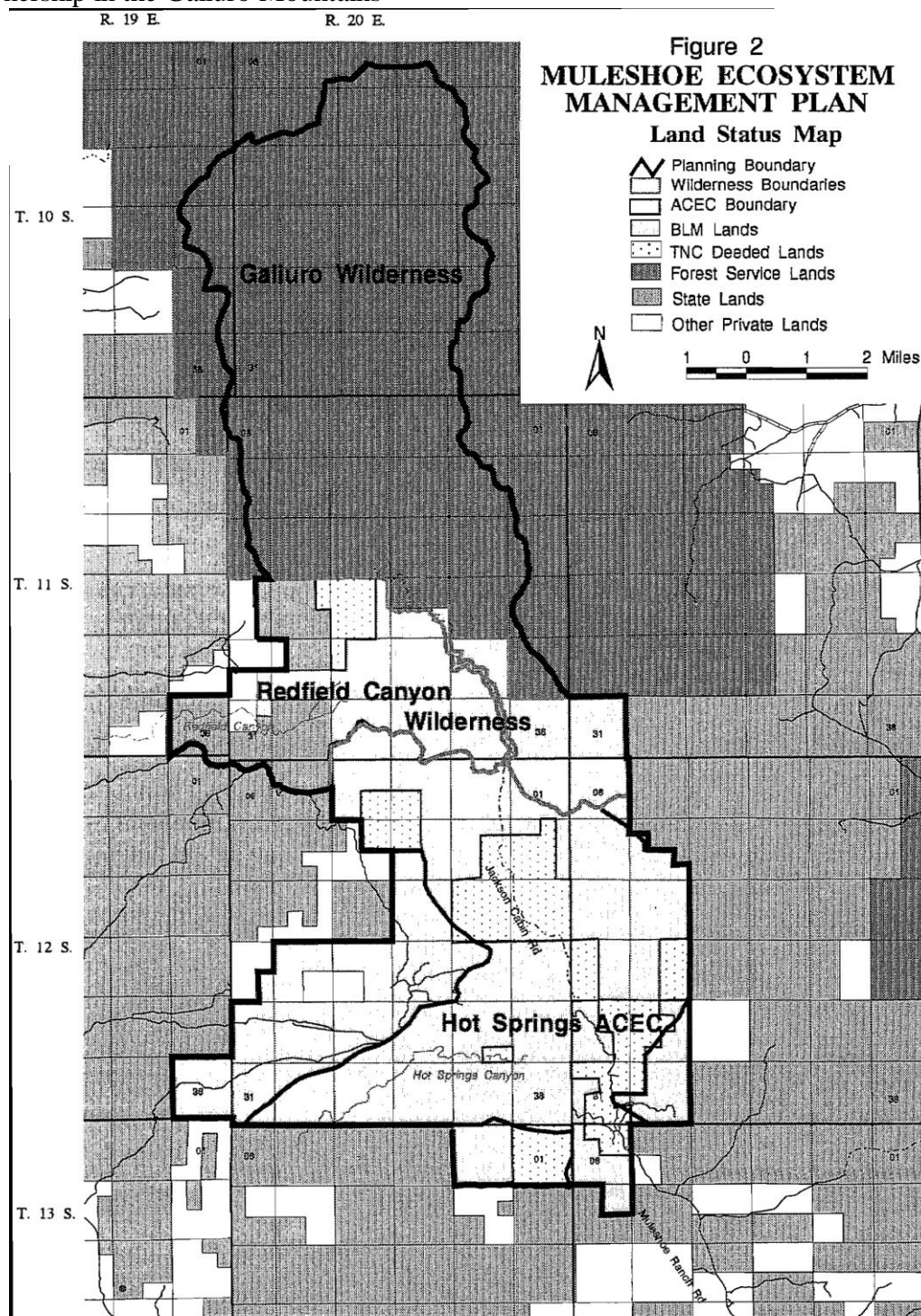


LAND OWNERSHIP AT THE PROJECT SITE(S):

(if the project area is private property, please state specifically and provide the landowner's name)
A mixture of State Land Department, USFS, BLM and potentially The Nature Conservancy.

*IF PRIVATE PROPERTY, IS THERE A COOPERATIVE BIG GAME STEWARDSHIP or
LANDOWNER AGREEMENT BETWEEN THE LANDOWNER AND THE DEPARTMENT?*
YES[] NO[] N/A[X]

Land ownership in the Galiuro Mountains



HABITAT DESCRIPTION:

Aravaipa Canyon

Aravaipa Canyon Wilderness is a 19,410 acres wilderness area located in the U.S. State of Arizona. It forms the northwest border of the Galiuro Mountain range. The wilderness is administered by the BLM and is located northeast of Mammoth, Arizona in Graham and Pinal counties, about 120 miles southeast of Phoenix. The wilderness includes the 11-mile long Aravaipa Canyon, the surrounding tablelands and nine side canyons.

The area's uniqueness is most evident in the diversity of wildlife habitat. The Aravaipa region consists of five major terrestrial communities: Sonoran Desertscrub, Desert Grassland/Semi-desert Scrubland, Interior Chaparral, Evergreen Woodland, and Deciduous Riparian Forest.

The cavernous, buff-and-brown colored walls you see as you walk through the canyon from the east are composed of Hell Hole Conglomerate, which extends to Parson's Canyon on the south wall and Hell Hole Canyon on the north wall. From here and continuing west, the Galiuro Volcanics begin and shape Paisano Canyon, and from Booger to Horse Camp Canyon. This mid-portion of the canyon displays impressive red, orange, and gray walls with columns towering over 1,000 feet.

On the West end of the canyon, between Virgus and Hell's Half Acre canyons, the creek cuts through a dark red porphyry (rock containing crystal structures). This rock is considered part of the Pinal Schist group which originated in the Precambrian Era. It is older and harder than the other formations and may be why the stream has cut a narrower channel in this area.

Galiuro Wilderness

The vegetation growing in Galiuro Wilderness varies from species of the semi-desert grassland type to those of the mixed conifer type. The majority of the south and west-facing slopes of the Galiuro Range are covered with dense stands of manzanita, live oak, mahogany and other brush species. The higher slopes and ridgetops have moderate to dense stands of juniper, pinon pine, and oak trees. Along the canyon bottoms and on the northern slopes of the higher elevations grow Arizona cypress, Ponderosa pine, Chihuahua pine, Mexican white pine, Douglas fir, and smaller stands of white fir. Deciduous trees such as sycamore, alder, maple, ash, walnut, and aspen grow in the riparian areas where springs supply water almost year-round, including Power's Garden, Mud Spring, Corral Spring, Juniper Spring, South Field Spring, Kielberg Dam, Walnut Spring, Cedar Spring, and Holdout Spring.

Elevations in the Galiuro Wilderness range from 4,000 feet to 7,671 feet at the summit of Bassett Peak. The Galiuro Mountain Range is a very rough and brushy block fault range characterized by block-like uplifts rising abruptly from relatively level plains that are characteristic of southern Arizona. Erosion has produced many rugged cliffs and steep slopes which have brightly colored exposed soils and rocks. The mountain is a double range bisected by two main canyons, Rattlesnake and Redfield. The wilderness boundary generally follows the forest boundary on the west and approximately one mile east of Trail 287 on the east. The most prominent peaks and high points in the Wilderness include Bassett Peak at 7,671 feet, Kennedy Peak at 7,540 feet, and Sunset Peak at 7,094 feet along the east divide. Those along the west divide include Rhodes Peak at 7,116 feet, Maverick Mountain at 6,990 feet, and Kielberg Peak at 6,880 feet.

Redfield Canyon Wilderness

The 6,600-acre Redfield Canyon Wilderness, part of the Muleshoe Cooperative Management Area, is located about 32 miles north of Benson, Arizona in Graham and Cochise counties.

Redfield Canyon is a narrow red-walled chasm containing tall cliffs pocked with eroded caves and

strewn with boulders. Located in the eastern part of the wilderness is the impressive Galiuro escarpment, an example of the fault-block development of the Basin and Range Province. Other small canyons containing perennial streams can be found in the area.

The Muleshoe Ecosystem is located in the Galiuro Mountains in southeastern Arizona within northern Cochise County and southern Graham County. The Ecosystem planning area encompasses the Muleshoe Cooperative Management Area (CMA) which is jointly managed by the Bureau of Land Management (BLM), Forest Service (FS), and The Nature Conservancy (TNC). The 57,500 acres comprise major portions of the Redfield, Hot Springs, and Cherry Springs watersheds. Included within the planning boundary are the Redfield Canyon Wilderness and Hot Springs Watershed Area of Critical Environmental Concern (ACEC), administered by the BLM, and a portion of the Galiuro Wilderness, administered by the FS.

ITEMIZED USE OF FUNDS:

Aravaipa and Redfield Canyon BHS Project Costs		
Description of Cost or Activity	Year 1	Year 2
Capture Costs	\$25,000	\$12,000
GPS Collars - \$4,000 ea (12 collars)	\$48,000	\$0
Disease and Genetic Sampling 22 samples (Yr1) and 10 (Yr 2) x \$400 ea	\$8800	\$4,000
Misc Equipment (ear tags, swabs, vials, razor blades, tools, tape, etc.)	\$1,000	\$500
Total	\$82,800	\$16,500

Special Big Game License Tag Funds

\$99,300 for the 2-year project

Cost Share or Matching Funds (for volunteer labor rates please refer to the worksheet below)

To be determined.

LIST COOPERATORS AND DESCRIBE POTENTIAL PARTICIPATION:

Arizona Desert Bighorn Sheep Society – volunteers, support and funding.

BLM – Safford – NEPA coordination

Coronado NF – NEPA coordination

The Nature Conservancy – to be determined

WOULD IMPLEMENTATION OF THIS PROJECT ASSIST IN PROVIDING, MAINTAINING, OR FACILITATING RECREATIONAL ACCESS?

YES[] NO[] N/A[X]

PROJECT MONITORING PLAN:

To be determined by regional personnel and largely addressed above.

PROJECT MAINTENANCE:

To be determined by regional personnel.

PROJECT COMPLETION REPORT TO BE FILED BY:

Regional personnel.

WATER DEVELOPMENT PROJECTS (*please use the worksheet below*):

TREE CLEARING/REMOVAL PROJECTS (*please use the worksheet below*):